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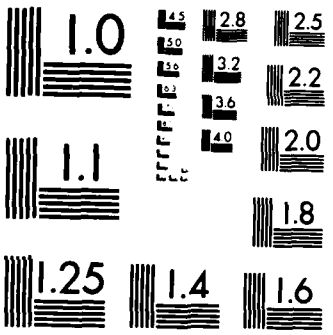

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Forces on Neutral Atoms Due to Electromagnetic Fields

Office of Naval Research

Contract N00014-83-K-0695

covering the period

1 September 1985 - 31 August 1986

Submitted by:

David E. Pritchard

4 September 1986

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
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Work by D. E. Pritchard and his collaborators is summarized here.

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PROGRESS REPORT

This ONR progress report covers the period 1 September 1985 - 31 August 1986.

A superconducting neutral trap has been constructed and preliminary tests of it have begun. The trap consists of superconducting solenoids to permit slowing and axial confinement and a superconducting octopole magnet for radial confinement in the trap. The trap includes several smaller winding for manipulating trapped atoms. The trap itself is about 40 cm long and has a diameter of 7 cm. It is about 1 Kelvin deep. Na atoms from an atomic beam are to be slowed and then stopped in the center of the trap with counterpropagating laser beams. Initial testing of the magnets, cryogenic vacuum apparatus, and atom source has been completed.

A program to optically trap atoms has been initiated. This is based on the recent discovery of exceptions to the optical Earnshaw theorem.[1] Several possible traps using only spontaneous forces have been suggested and detailed modelling of these traps is underway. An apparatus to trap atoms based on these new ideas is being constructed.

1. D.E. Pritchard, E.L. Raab, V. Bagnato, C.E. Wieman and R.N. Watts, Phys. Rev. Lett. **57**, 310 (1986).

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